



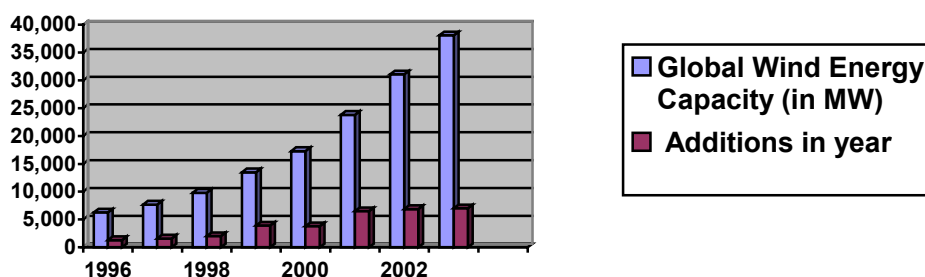
## Global Wind Energy Market Report

### Wind Energy Industry Continued to Grow at Fast Pace in 2002 Global Installations Increased by 28%

#### World Growth

Cumulative global wind energy generating capacity topped 31,000 megawatts (MW) in 2002. Some 6,868 MW of new capacity were installed worldwide during the year, an increase of 28%, according to preliminary estimates by the American Wind Energy Association and the European Wind Energy Association.<sup>1</sup> Wind plants now power the equivalent of 7.5 million average American homes (16 million average European homes) worldwide.

Global wind power generating capacity has quadrupled over the past five years, growing from 7,600 MW at the end of 1997 to an estimated 31,128 MW at the end of 2002 -- an increase of over 23,000 MW. Wind is the world's fastest-growing energy source on a percentage basis, with installed generating capacity increasing by an average 32% annually for the last five years (1998-2002). The slightly slower rate of 28% in 2002 was primarily due to a lull in the U.S. market.

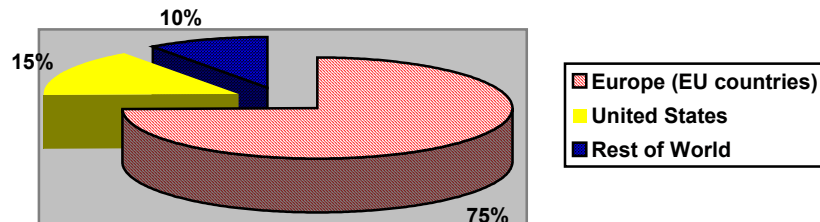


The new equipment, an investment worth \$7 billion, was brought on line mainly in Europe (European Union member countries), which is home to three-fourths of the world's wind power generating capacity. The United States, which accounts for 15% of the global

<sup>1</sup> Figures are based on year-end national estimates reported by wind and renewable energy associations and other sources.

wind power market, saw only moderate growth, as proposed projects were put on hold pending an extension of a key federal incentive, the wind energy production tax credit.

Ninety-three percent (93%) of the additional capacity installed in 2002 was in Europe and the United States, and worldwide 90% of cumulative capacity is found in those two regions.



**World wind power generation, by region**

<b>Top five wind energy markets (installed capacity, in MW)</b>	<b>2001 Additions</b>	<b>2001 Year End Total</b>	<b>2002 Additions</b>	<b>2002 Year End Total</b>
Germany	2,659	8,754	3,247	<b>12,001</b>
Spain	835	3,337	1,493	<b>4,830</b>
United States	1,695	4,275	410	<b>4,685</b>
Denmark	117	2,417	497	<b>2,880</b>
India	240	1,407	195	<b>1,702</b>

## **Regional Highlights**

### **Europe**

Europe continued to drive the engine of global wind power growth. A total of 5,871 MW – worth €5.8 billion( \$6.3 billion) – was installed in the E.U. countries in 2002. Total regional wind power capacity grew 33% to 23,056 MW. The electricity production from Europe's wind power fleet is equivalent to that produced with 20 million tons of coal burned annually in a conventional power plant, according to the European Wind Energy Association. Germany, Spain and Denmark alone accounted for 89% of the wind power capacity installed in Europe in 2002. Non-E.U. European countries (such as Norway and Poland) contributed an additional 112 MW to the region's wind power growth.

**Germany:** With 3,247 MW of new installations, Germany accounted for 55% of the installed capacity. Germany's wind power capacity of 12,001 MW generates enough to meet 4.5% of national electricity needs. The German wind energy industry employs

45,000 people, a fifth of whom were hired in 2002. Most of the turbines installed in Germany are manufactured in the country.

Wind power generation is concentrated in the northwestern regions of the country. Schleswig-Holstein's target of 25% of power to be generated from wind by 2010 has already been achieved; Mecklenburg-West Pomerania gets 21% of its power from the wind; Saxony-Anhalt, 18%; and Lower Saxony and Brandenburg, 14%.

**Spain:** Spain installed 1,493 MW of new wind capacity, pulling ahead of the U.S. into second place worldwide in terms of total installed capacity, which reached 4,830 MW at year's end. Spain's wind power generation has soared over the past decade: in 1993 just 52 MW were in place, in Tarifa across the straits of Gibraltar from Morocco. The take-off was triggered by federal requirement that utilities pay a guaranteed premium price for electricity from wind over the first five years of the project—an incentive similar to the one that gave birth to the German wind energy market. State (or "province") governments eager to capitalize on the benefits of wind power have also sought to boost such development locally and required that a large share of the investments (such as manufacturing and construction) remain in the local economy. Large wind power installations are to be found in Galicia, Aragon, Navarra, and Castilla.

**Denmark:** Denmark installed 497 MW to reach 2,880 MW, enough to meet 20% of the country's electricity needs. This makes Denmark – a country about the size of Maine -- the nation that gets the highest percentage of its electricity from wind. The Danish wind energy industry is a mainstay of the country's economy with an annual turnover of close to \$3 billion, according to EWEA, and wind turbines and wind energy technology are a major export item. About half of the turbines being installed worldwide today are of Danish origin.

**The Netherlands** (217 MW) and **Italy** (103 MW) reached three-digit figures for installation in 2002, according to EWEA.

**United Kingdom:** In the U.K., 78 MW of wind power came on line and 525 MW won planning permission in 2002, including two offshore wind farms, an indication that the market is picking up. The amount of wind power capacity in the U.K. stood at 552.195 MW at the end of 2002, generating 1,450 million kWh of clean electricity, equivalent to the annual electricity needs of well over 350,000 British households. In early 2003, the U.K. government issued an energy white paper indicating that the country would turn to renewables—and not nuclear power—in its effort to curb emissions.

## **North America**

**United States:** The U.S. wind energy industry turned in a solid performance in 2002 in spite of uncertainty over the extension of a key federal incentive, the wind energy production tax credit (PTC), and an overall retrenchment in the broader energy industry. U.S. installed wind electric generating capacity expanded by nearly 10% during the year, with 410 MW of new equipment going into service (enough to meet the annual needs of

approximately 120,000 average American homes). At year's end, wind plants in 27 states across the country totalled 4,685 MW, enough to serve more than 1.3 million households.

The PTC was renewed in March 2002-- but only until Dec. 31, 2003. AWEA expects 2003 to be a much stronger year, as developers race to install projects before the year-end credit expiration deadline. The U.S. wind energy industry is urgently seeking a multiyear extension to provide a more stable investment signal and avoid the devastating impacts similar to those it experienced when the PTC was allowed to expire in 1999 and 2001.

**Canada:** Canada added about 40 MW in 2002, according to the Canadian Wind Energy Association (CanWEA). With completion of a 5.9-MW project at Gull Lake, the province of Saskatchewan is now the third-largest producer of wind energy in Canada, after Quebec and Alberta.

### **Rest of World**

Relatively few projects were completed or reported completed in the rest of the world in 2002, and these were mainly in Asia and the Pacific region.

**Australia:** Two projects totalling 31.5 MW in generating capacity were added in 2002. Total installed capacity at year-end was 103 MW.

**Japan:** Japan added a total of about 140 MW—a substantial increase that almost doubled the capacity installed in the country. Several Japanese power companies are bidding for additional projects, which may add another 200 MW to the grid by 2004.

**India and China,** two nations with a large potential and vast electricity demand, added 195 MW and 68 MW respectively.

Prospects for developing a raft of projects in **Argentina** announced by a Spanish company in 2001 have vanished, a casualty of that country's deep economic crisis. Proposed projects in **Brazil** totaling well over 1,000 MW (see last year's Global Markets Report) may be held up as well.

In an effort to help stimulate renewable energy development in developing countries, the U.S. National Renewable Energy Laboratory (NREL) and United Nations Environment Program (UNEP) are undertaking a joint solar and wind energy resource assessment (SWERA) for **Bangladesh, Brazil, China, Cuba, El Salvador, Ethiopia, Ghana, Guatemala, Honduras, Kenya, Nepal, Nicaragua, and Sri Lanka**. The mapping project is funded by a U.S. \$6.7 million investment from the Global Environmental Facility (GEF). Solar and wind energy information will be assembled into CD-ROMS and incorporated into a user-friendly Geographical Information System (GIS) tool. More information on the project is available at <http://www.uneptie.org/energy/act/re/fs/docs/swera.pdf>.

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### Global Wind Energy Generating Capacity (AWEA and EWEA estimates)

<b>Wind Energy Markets*</b> (by installed capacity, in MW)	2001 Year End Total	2002 Additions	2002 Year End Total
<b>Country</b>			
USA	4,275	410	4,685
Canada	198	40	238
<b>North America</b>	<b>4,473</b>	<b>450</b>	<b>4,923</b>
Germany	8,754	3,247	12,001
Spain	3,337	1,493	4,830
Denmark*	2,489	497	2,880
Italy	682	103	785
Netherlands*	486	217	688
UK*	474	87	552
Sweden	293	35	328
Greece	272	4	276
Portugal	131	63	194
France	93	52	145
Austria	94	45	139
Ireland	124	13	137
Belgium	32	12	44
Finland	39	2	41
Luxembourg	15	1	16
<b>EU Total</b>	<b>17,315</b>	<b>5,871</b>	<b>23,056</b>
Norway	17	80	97
Ukraine	41	3	44
Poland	22	5	27
Latvia	2	22	24
Turkey	19	0	19
Czech Republic	6.8	0.2	7
Russia	7	0	7
Switzerland	5	0	5
Hungary	1	1	2
Estonia	1	1	2
Romania	1	0	1
<b>Other Europe</b>	<b>123</b>	<b>112</b>	<b>235</b>
India	1,507	195	1,702
Japan	275	140	415
China	400	68	468
Australia	72	32	104
Egypt, Morocco, Costa Rica, Brazil, Argentina, others	225 (est.)		225 (est.)
<b>Other Total</b>	<b>2,479</b>	<b>435</b>	<b>2,914</b>
<b>World Total</b>	<b>24,390</b>	<b>6,868</b>	<b>31,128</b>

*\* The difference between end 2001 and end 2002 figures is 6,738 MW. The discrepancy of 130 MW is due to decommissioning in Denmark (106 MW), Netherlands (15 MW), UK (9MW)*

